

# NOTES 19: CLT-BASED INFERENCE FOR PROPORTIONS

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CLT: The Central Limit Theorem (CLT) tells us that if the sample size is big enough and the sample is random,

$$\bar{X} \sim N(\text{____}, \text{____})$$

$$\hat{p} \sim N(\text{____}, \text{____})$$

The general form for a confidence interval is:

Example: Finding  $z^*$

- 95% confidence interval
- 68% confidence interval
- 99% confidence interval
- 90% confidence interval

## 1 How big is big enough?

Example 1:  $\hat{p} = .5$

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Rule of Thumb for Proportions:

- Expected count in each category (Yes/No) should be  $> \text{____}$
- $np > \text{____}$  and  $n(1-p) > \text{____}$

## 2 How do we find the SE?

Standard Error for Proportions:

Idea: As  $n$  gets bigger, the SE gets \_\_\_\_\_. If  $\hat{p}$  is close to .5, the SE is \_\_\_\_\_ than if  $\hat{p}$  is close to 0 or 1

Example: ESP Example Again

$n = 14$

```
p_hat = 3/14
n = 14
SE_p = sqrt((p_hat*(1-p_hat))/n)
z_score = (p_hat - .2)/SE_p
p_val = pnorm(z_score, lower.tail = FALSE)
p_val
```

[1] 0.4482

$n=1400$ :

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Big Picture Picture